A New Subspecies of *Solanum scabrum* Miller Found in Uganda

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Abstract. *Solanum scabrum* Miller has been reported almost exclusively from cultivation as a vegetable for human consumption. However, molecular and morphological data indicate that a wild taxon exists in Uganda. This wild taxon was previously identified as the poisonous *S. nigrum* L., but local people use its leaves as food. This taxon is here described as a new subspecies, *S. scabrum* Miller subsp. *laevis* Olet. Morphological descriptions and a key to separate the two subspecies of *S. scabrum* are given.

Key words: Black nightshade, edible crop, garden huckleberry, IUCN Conservation Status, Solanaceae, *Solanum*, Uganda.

The section *Solanum* L., commonly known as black nightshades in the *S. nigrum* L. complex, is one of the largest and most variable species groups of the genus *Solanum* L. and consists of about 30 species, most of which originate from the New World tropics, particularly South America (Edmonds, 1972). Members of *Solanum* sect. *Solanum* were either lumped under *S. nigrum* or treated as numerous microspecies until the work of Edmonds and Chweya (1997), leading to a number of synonyms; the most well known ones for *S. scabrum* Miller are *S. guineense* (L.) Miller, *S. intrusum* J. Soria, *S. melanocerasum* Allioni, *S. nigrum* var. *guineense* L., *S. nigrum* subsp. *guineense* (L.) Persoon, and *S. tinctorium* Welwitsch. This has resulted in considerable confusion. The synonymy has been discussed by Heine (1960), Henderson (1974), and Edmonds (1979).

Solanum scabrum, commonly known as garden huckleberry, is by far the most commonly cultivated nightshade, and according to Berinyuy et al. (2002) it is probably the most important indigenous leafy vegetable in Africa, widely grown in the humid forest zone of Central and West Africa. It has also been cultivated in America and in southern Asia (Defelice, 2003). In southwest Uganda, *S. scabrum* is both a subsistence and a commercial crop. Typical plants are rare in Uganda, having been recorded from only the extreme southwestern part (Bukenya & Carasco, 1995). Literature reports *S. scabrum* almost exclusively from cultivation (Berinyuy et al., 2002; Bukenya & Carasco, 1995; Defelice, 2003). However, recent molecular studies (Olet et al., 2005) have shown that a wild form exists in Uganda. Botanists have previously identified this form as *S. nigrum*, a taxon well known for being highly poisonous, but the African plants so identified are used for human consumption in Africa. This enigma was addressed by Olet et al. (2005).

Amplified fragment length polymorphism (AFLP, Vos et al., 1995) is the marker of choice for studying intraspecific variation (Bensch & Åkesson, 2005; Weising et al., 2005). AFLPs have been used to pinpoint the domestication site for Einkorn wheat (Heun et al., 1997) and the potato (Spooner et al., 2005), as well as for the molecular taxonomy of *Vicia* L. (Wouw et al., 2001), *Vitis* L. (Fanizza et al., 2003), and *Solanum* (Lara-Cabrera & Spooner, 2004).

Our molecular study using AFLP marker analysis (Olet et al., 2005) showed that the Ugandan plants previously determined as *Solanum nigrum* are in fact *S. scabrum*, which consists of two taxa: the wild small-fruited and the cultivated large-fruited types, both used as vegetable. Typical *S. nigrum* is not used as food (Berinyuy et al., 2002), and it is now realized that this species possibly does not occur in tropical Africa (except as a casual). According to Defelice (2003), *S. nigrum* appears to be a primarily temperate plant with only a scattered presence in tropical areas. In a numeric taxonomic study of *S. scabrum* (Olet, 2004), we investigated ca. 40 live plants of subspecies *scabrum* Miller and ca. 30 live plants of subspecies *laevis* Olet. In addition, a number of herbarium sheets were considered but were not measured in detail.

Both the cultivated and wild taxa of *Solanum scabrum* are morphologically similar in their overall color, pubescence, and leaf and fruit characters. However, the wild taxon has a non-angular smooth stem, a more prominent geniculate style, and smaller leaf and fruit characters than the cultivated form. The

wild taxon of *S. scabrum* may be the original plant from which the large-fruited *S. scabrum* was selected, as that is a typical domestication trait. The development of the angular to almost winged spiny stem is more difficult to explain.

We propose that the two taxa of *Solanum scabrum* that are prominently different in morphology be given subspecific status, the cultivated taxon being *S. scabrum* subsp. *scabrum* and the wild taxon being *S. scabrum* subsp. *laevis*.

It is, of course, debatable whether one should use a formal category to distinguish a wild plant from its assumed derived cultivated taxon. In our opinion this must ultimately depend on the magnitude of the morphological differences and whether merging or differentiating the taxa will provide the most elucidating taxonomic treatment. In this case it is of paramount importance to have a separate name for the wild taxon; otherwise, botanists might continue to erroneously name the wild plant *Solanum nigrum*, as the plant is superficially more similar to this species than to cultivated *S. scabrum*. In any stage of development, the two subspecies are easily separated because of the non-angular stem in subspecies laevis.

A very similar case exists regarding the scarlet eggplant, *Solanum aethiopicum* L. Lester and Daunay (2004) describe four cultivar groups of this species, viz. *S. aethiopicum* Gilo Group, *S. aethiopicum* Shum Group, *S. aethiopicum* Kumba Group, and *S. aethiopicum* Aculeastrum Group. *Solanum anguivi* Lamarck is the wild ancestor of these cultivars, but no botanist has concluded that *S. anguivi* must be considered part of *S. aethiopicum* without formal distinction. In maize, *Zea mays* L. subsp. *mays*, the wild form (teosinte) is named *Z. mays* subsp. *parviglumis* Iltis & Doebley (Doebley, 2004), and although Beadle (1980) and Szabó and Burr (1996) demonstrated that the two differ in as few as five major gene changes only, to give the two exactly the same Latin name would bring only confusion to users. The same can be said for Einkorn, *Triticum monococcum* L. subsp. *monococcum*, where its wild form is named *T. monococcum* subsp. *boeoticum* (Boissier) C. Yen. As has been shown for maize (Matsuoka et al., 2002), the domesticated Einkorn wheat groups closely with those wild forms from where it is derived and less with the remaining wild forms, allowing the pinpointing of the domestication site (Heun et al., 1997). A similar result has been obtained with the potato (Spooner et al., 2005) and a variety of crop species such as coffee, tetraploid wheats, barley, and cotton.

KEY TO THE SUBSPECIES OF *SOLANUM SCABRUM* IN AFRICA

1a. Stems angled, winged, ridge teeth prominent; leaf apices obtuse to acute; inflorescence often branching, peduncle at right angles with branch, not ascending, flowers purple in Ugandan collections, white in the gene bank accessions, anthers brown, purplish brown, or yellow; mature fruits large, 10–15(16–17) mm broad, fruiting pedicel erect, fruit persistent . . . . . *S. scabrum* subsp. *scabrum*

1b. Stems terete, wings and ridge teeth absent; leaf apices acuminate to almost aristate; inflorescence without branching, peduncle at less than 90° with branch and ascending, flowers white, anthers yellow; mature fruits smaller, 8–10 mm broad, fruiting pedicel reflexed, fruit persistent or deciduous . . . . . *S. scabrum* subsp. *laevis*

1a. Solanum scabrum subsp. **scabrum** Miller, Gard. Dict., ed. 8. 1768. TYPE: U.S.A. Virginia. *P. Miller s.n.* (lectotype, BM).

Erect herb or subshrub ca. 0.7–1.2 m, with few branches spreading horizontally, moderately to densely pubescent with simple appressed eglandular hairs (pilose); stems purple or greenish purple, angled with prominent dentate wings. Leaves orbicular to broadly ovate, 10–14(16) × 6–13.5 cm; lamina purplish green or green with a purple tint; veins purple; leaf base cordate to truncate; leaf apex acute, subacute to obtuse, rarely cuspidate; leaf margin sinuate to entire or entire; petiole winged halfway up or not winged. Inflorescence umbellate to racemose or of extended cymes, sometimes branching once, 6- to 12(16)-flowered; peduncles at right angles with branch, 1.6–3(3.3) cm; pedicels reflexed or straight, 6–10 mm. Corolla stellate, purple with dark green to yellowish green base, 11–14(16) mm wide; style 3–4 mm, geniculate, rarely straight, exserted ca. 0.5–2 mm beyond anthers, rarely absent; calyx campanulate, rarely stellate; anthers brown, purplish brown, or yellow with deep purple tint and dark purple middle, (2)2.5–3 mm long. Ripe fruits deep purple to black with deep blue to purple pulp, or deep purple to black with dark blue pulp, 10–15(16–17) mm broad; fruit cuticle thick and opaque; mature sepal lobes ovate, mature calyx reflexed away from berry, strongly adherent, persistent; fruits persistent on plant when ripe; fruit pedicel erect or reflexed; seeds creamish green to brown, (1.7)1.8–2.1 mm; stone cells absent.

The type of the autonymic subspecies is taken from a plant cultivated in Chelsea Physics Garden in London (Miller, 1768). For more details on lectotypification see Henderson (1974) and Edmonds (1979).

Because this plant is so widely cultivated in the tropics of both hemispheres, it has previously been difficult to ascertain its origin (Edmonds & Chweya, 1997; Bukenya & Carasco, 1995). Today, it is probably most widely cultivated in West Africa (Berinyuy et al., 2002), while in Uganda it is rare and is cultivated only in Kigezi, in southwest Uganda.

Notes on the type. The type of *Solanum scabrum* at BM is nearly 250 years old, but it is in excellent condition with flowers and young fruits. The only important character that cannot be observed is the size of the mature berry. However, with its winged spiny stem, it is noticeably different from subspecies *laevis* described below.

Vernacular name. Nswiga ya Kizungu (Lukiga).

Collections from Uganda (DNA-tested). Western region: Kigezi, Kabale distr., Rubanda co., Kachwekano farm, 10 km SW of Kabale town, 2001, *E. A. Olet 48, 49 & 50* (MHU).

Collections from Uganda (not DNA-tested). Wes-Western region: Kigezi, Ruzhumbura, Bugangari, near habitation, Feb. 1949, *J. W. Purseglove 2712* (K); Kigezi D.F.T., open waste places near cultivated plots, 28 Aug. 1972, *P. M. Goode 3/72* (K).

1b. Solanum scabrum Miller subsp. **laevis** Olet, subsp. nov. TYPE: Uganda. U4, Buganda, Kampala district, Kawempe div., Kawempe North, Kalerwe, Tula rd., edge of barbed wire fence next to local road, 1220 m, 14 Feb. 2001, *E. A. Olet 88* (holotype, MHU; isotypes, K, MO). Figure 1.

Herba annua; caule laevi herbaceo; ramis teretibus. Foliis ovatis, non dentato-angulatis, glabris. Inflorescentia 4 ad 10 flora. Calyx 5-lobatus, in statu fructifero reflexus; corolla alba. Baccae fere 10 mm diam., globosae, nigrae; semina 1.5–2 mm longa.

Semi-decumbent spreading herb, about 0.7–1.2 m high, highly branched, subglabrous to glabrous, pilose; stems purple to greenish purple, terete and expanded at nodes. Leaves cordate, 6–13.4 × 3.3–7.3 cm; lamina dark green or dark green with purple patches; veins purple; leaf base truncate, rounded, subcuneate to cuneate; leaf apex acute to acuminate, sometimes aristate; leaf margin repand to entire; petiole winged halfway or not winged. Inflorescence lax cymes or lax usually extended cymes, (4)6- to 8(10)-flowered; peduncle at less than 90° with branch, ascending, 1.2–2 cm. Pedicels reflexed, 4.5–7(8) mm; mature calyx campanulate; corolla stellate, white with green to greenish yellow base, up to 12(13) mm wide; style (3.2)3.5–4.5(4.7) mm, prominently geniculate, exserted ca. 1.3–2 mm beyond anthers; anthers yellow to deep yellow, (2)2.3–3 mm. Ripe fruits deep purple to shiny black with greenish pulp, up to 10 mm broad; fruit cuticle of medium thickness and opaque; mature sepal lobes ovate, mature calyx reflexed away from berry, remains attached or not, fruits remaining or falling off from plant, fruit pedicel reflexed; seeds creamish green, 1.5–2 mm; stone cells absent.

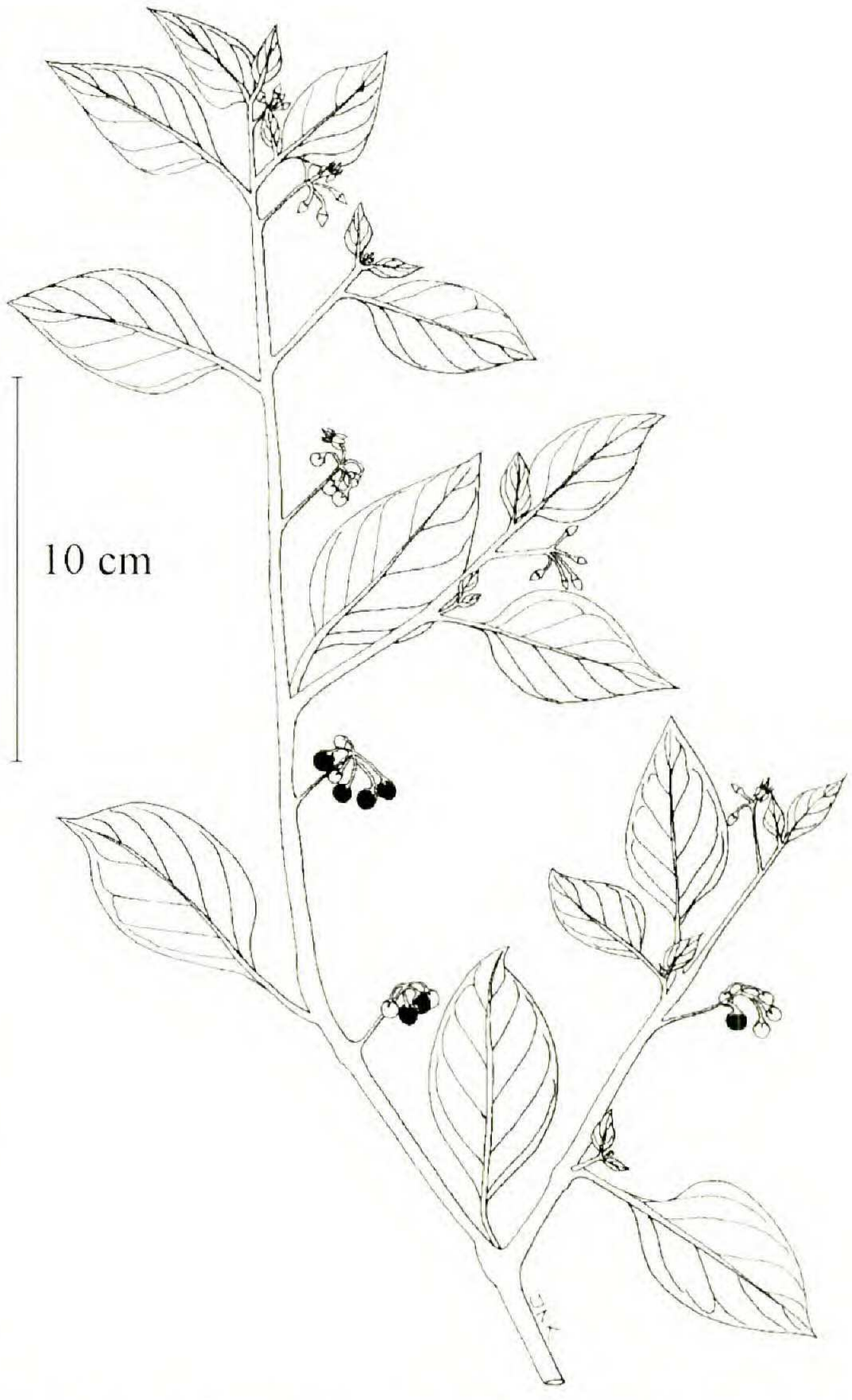

Figure 1. *Solanum scabrum* L. subsp. *laevis* Olet, the wild subspecies of the garden huckleberry. Drawn by Janet Nabakooza from the holotype *E. A. Olet 88* (MHU).

Habitat and distribution. Along streams and in open parts of upland forests, especially Mt. Ruwenzori, but also in gardens and banana plantations, 1080–2500 m.

Phenology. In Uganda flowering is reported in February, March, May, August, November, and December, and fruiting in the same months.

Conservation status. This taxon is here assessed as Least Concern (LC), using the criteria detailed by IUCN (2001).

Note. Although we are describing subspecies *laevis* from Uganda only, it is very likely a mostly West African plant with its easternmost distribution area in Uganda. It is likely that West African wild forms are so intermixed with the cultivated plants that they are less easily recognized than in Uganda, where cultivation is very restricted.

Paratypes. UGANDA. Eastern region, Busoga, Kamuli dist., Bulamogi co., Namugongo subco., Bukomankola, 2 km W of Kaliro town, *E. A. Olet 11* (K, MHU); Mwiga, 4 km NW of Kaliro, *E. A. Olet 14* (MHU, NLH); 1 km W of Kaliro, *E. A.*

Olet 15 (K, MHU). Central region, Buganda, Kampala dis., Kawempe div., Kawempe south, Makerere University, *E. A. Olet 70* (EA, MHU).

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